

Possible Uptake of Mars Atmospheric Gases by an Extant Biosphere. Pin Chen¹ and Yuk L. Yung², ¹Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, pin.chen@jpl.nasa.gov, ²California Institute of Technology, Pasadena, CA 91125, yly@gps.caltech.edu.

Abstract: “All life forms metabolize one or more gasses. Indeed, a reasonable definition of life on Earth could require the metabolism of one or more gasses of which CH₄ is an example.” [1] As such, some of life’s footprints inevitably manifest themselves as sources and sinks of atmospheric gases [2]. From the “sink” perspective, what limits does current knowledge of the Martian atmosphere place on a putative biosphere? What future measurements will help detect and discern biological sinks? This talk provides an overview of current knowledge and suggests future measurement strategies regarding these two questions. In particular, we discuss Mars’s atmospheric (chemical and isotopic) composition in the context of metabolisms of known lifeforms on Earth (e.g. methanotrophs and sulfur-reducing bacteria) that can be relevant to Mars. We aim to infer upper limits on a possible extant Martian biosphere. We also discuss future measurements that will advance our knowledge regarding possible metabolic activities on Mars. In particular, we present relevant examples of terrestrial measurements in variabilities of gas abundances and stable-isotopic compositions to guide future exploration strategies.

References:

[1] Ferry, J. G. (2010) *Planetary & Space Science*, 58, 1775–1783. [2] Yung, Y. L., and W. D. DeMore (1999), *Photochemistry of Planetary Atmospheres*, New York: Oxford University Press.